PROCEEDINGS OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. X. 1865. No. 74.

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PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

VOL. X. JULY, 1865. No. 74.

Stated Meeting, July 21, 1865.

Present, five members.

Dr. B. H. COATES in the Chair.

Donations for the library were received from the Essex Institute, American Antiquarian Society, Messrs. Natali and Bond, Mr. Samuel Wilkinson, Dr. William Elder, the Mercantile Library Association at Cincinnati, the London Geological Society, the Franklin Institute, the Holland Academy of Sciences, Prof. Thomas Chase, and the Union League of Philadelphia.

The death of Mr. William Parker Foulke, at 1827 Pine Street, Philadelphia, aged 50, on the 19th ult., was announced by Dr. Ruschenberger, and Mr. A. H. Smith appointed to prepare an obituary notice of the deceased.

The death of Admiral Dupont, at the La Pierre House, Philadelphia, on the 23d ult., aged 63, was announced by Prof. Trego.

The death of Dr. Christien Jürgensen Thomsen, Director of the Musée des Antiquités Nationals, &c., at Copenhagen, May 21st, at the age of 76, was announced by letter.

The death of Mr. James Dundas, at Philadelphia, on the 4th inst., aged 80, was announced by Prof. Trego.

The death of the Rt. Rev. Bishop Alonzo Potter, of Pennsylvania, who died at San Francisco on the 4th inst., aged 65, was announced by Mr. Chase; and the Rt. Rev. Bishop Stevens was appointed to prepare an obituary notice of the deceased.

Prof. Cresson made a communication on four simultaneous rainbows which he observed at Atlantic City on the 7th inst.

Mr. Chase announced that he had made certain experiments on aerial currents as producing magnetical polarity.

The election for members was postponed.

New nomination No. 541 was read.

And the Society was adjourned.

Stated Meeting, August 18, 1865.

Present, four members.

Prof. Cresson, Vice-President, in the Chair.

Letters acknowledging the receipt of Proceedings No. 73 were received from the Essex Institute, the New Hampshire Historical Society, the Northern Academy at Hanover, N. H., and the U. S. Coast Survey.

Letters announcing donations for the library were received from the Central Statistical Commission, Bruxelles, July 7th, and Dr. Peters, of Altoona.

Donations for the library were received from the British Meteorological and Liverpool Philosophical Societies; Harvard College; Mr. Hough, of Albany; Hon. W. H. Brown, of Chicago; the Nat. Hist. Lyceum and Rensselaer Polytechnic Institute of New York; the Entomological Society, Franklin Institute, Academy of Natural Sciences, and Dr. Leidy, of Philadelphia; and the Santa Clara College, San Francisco.

Dr. Ruschenberger announced the death of a member, Mr.

Charles J. Wister, at Germantown, July 23d, in the 84th year of his age.

Prof. Cresson made a further communication in relation to the rainbow phenomenon described at the last meeting.

And the Society was adjourned.

Stated Meeting, September 15, 1865.

Present, eight members.

Dr. COATES in the Chair.

A letter was received from the Linnean Society of Lancaster City and County, J. R. Sypher, Corresponding Secretary, dated August 7th, forwarding the following resolution of that Society:

Resolved, That the Linnean Society of Lancaster City and County furnish the American Philosophical Society with a complete set of plaster casts of the figures on the Indian Rocks in the Susquehanna, as far as they can be obtained.

On motion of Dr. Le Conte, the Society was placed on the list of correspondents, to receive the Proceedings from the present time.

Letters announcing donations for the library were received from Dr. Otto Roëhrig, dated New York, Sept. 6, 1865, and from Mr. H. Burmeister, Curator of the Public Museum at Buenos Ayres, dated May 24, 1865, requesting exchange of publications.

On motion of Dr. Le Conte, it was ordered that the Museum be placed upon the list of corresponding members to receive the Transactions and Proceedings.

Donations for the library were received from M. Barrande, of Prague; Prof. Zantedeschi, of Padua; the Nat. Hist. Society of Bonn; the Madrid Observatory; the Bureau of Mines

at Paris; the Astronomical, Geographical, and Zoological Societies at London; the Essex and Franklin Institutes; Mr. S. F. Haven; Dr. Roëhrig; Prof. J. D. Whitney; the New York Lyceum; the Librarian of Congress; and the Public Museum at Buenos Ayres.

The death of Sir William J. Hooker, at Kew Gardens, England, on the 12th of August, aged 80, was announced by the Secretary.

A communication entitled "The Nebular Theory," by Prof. Ennis, of Philadelphia, was read by the Secretary.

Pending nominations 540, 541, were read.

And the Society was adjourned.

Stated Meeting, October 6, 1865.

Present, nine members.

Prof. CRESSON, Vice-President, in the Chair.

Letters with photographs were received from Sir Henry Holland, London, Sept. 6th, and Prof. E. N. Horsford, Cambridge, Mass., June 24th. The photograph of Mr. William P. Foulke was added to the album.

Mr. A. H. Smith accepted the appointment to prepare an obituary notice of Mr. Foulke.

Donations for the library were reported from Prof. Zantedeschi, of Padua; Dr. Schinz, of Strasbourg; the Bureau des Mines; the Essex and Franklin Institutes; Harvard Observatory; the American Journal of Science; Prof. Silliman; Dr. G. B. Wood; Mr. Lamborn; the Ressel Committee, and various booksellers.

The death of Dr. Wayland, President of Brown University, at Providence, R. I., September 30th, aged 69, was announced by Mr. Trego.

The committee on M. Julien's paper reported progress.

Mr. Lesley described some relics lately exhumed from Indian graves near Wilkesbarre. Dr. Coates referred to the wearing away, without decay, of the teeth in skulls found in tumuli and graves on the West Branch Susquehanna and elsewhere.

Mr. Chase presented a detailed account of his experiments upon the Mechanical Polarization of Magnetic Needles under the influence of Fluid Currents, or Faraday's "Lines of Force."

I have already published three simple experiments in mechanical polarization (Proc. Amer. Philos. Soc., ix, 359), and I have endeavored, in various ways, to show that terrestrial magnetism is probably owing to an analogous polarization of aerial and æthereal currents. Finding that my hypothesis was sustained by some remarkable numerical coincidences, as well as by various points of correspondence between the assumed influence of gravitation-currents and the observed daily variations of declination and inclination, I sought for some practical demonstration of the truth of my inferences. I therefore endeavored to imitate the movements of the atmosphere by mechanical contrivances, and the results, which are in most respects such as I anticipated, and which are all susceptible of an easy explanation, are embodied in the following additional experiments.

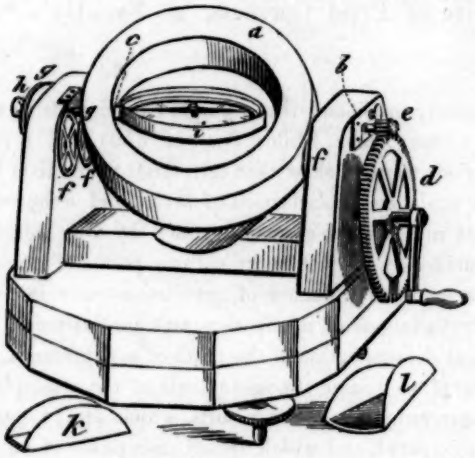
4. By the use of fans, bellows, and blowers of various kinds, either alone or in conjunction with directing discs, currents may be produced that will deflect the needle in any desired direction, in accordance with simple and evident mechanical laws.

5. I have tried iron, copper, wood, zinc, and pasteboard, and find, as I anticipated, that the material employed for producing or directing the artificial currents has no effect upon their mere *mechanical* action; but I have found the results most satisfactory when, in order to avoid the complication of induced magnetism or electricity, I employed non-conductors, such as wood and pasteboard. Upon subsequently repeating the experiments with different metals, the effects of the induced currents have been plainly shown.

6. Increasing the number of directing discs (provided they are all parallel) often modifies the intensity of current-influence, but does not appear otherwise to affect the result.

The most striking developments that I have yet hit upon were ob-

tained by the aid of a Gaussian modification of Faraday's apparatus for showing the electric currents developed in moving metallic bodies by terrestrial magnetism. It consists of a heavy copper ring (*a*), fixed to horizontal supports (*b*) (*c*), on which it can be rapidly rotated by a wheel (*d*) and pinion (*e*), the supports being relieved by friction-wheels (*f*). The outer diameter of the ring is 6 inches at each



edge, and $6\frac{3}{16}$ inches in the middle; the inner diameter, 5 inches; the thickness, $1\frac{1}{2}$ inches. The axle opposite to the gearing (*g*) is hollow, to allow the insertion of a brass rod (*h*), which supports a compass (*i*) horizontally in the interior of the ring. The compass is not shielded by a glass, and it is therefore easily affected by aerial currents. If the ring is made to revolve around the compass needle, the N. pole of the needle is deflected in a direction opposite to the motion of the top of the ring.*

For my special purpose, I replaced this copper ring by a wooden one of the same dimensions, and prepared a number of discs (*k*) (*l*), in the form of semicircles and circular segments, fitted so that they could be fixed, in different vertical positions, in the compass box, above the needle. Causing the wheel to rotate, with the axis variously placed, I tried the following experiments:

* For the use of the apparatus, I am indebted to the kindness of President Richard S. Smith, of Girard College.

A. Single disc, or multiple and parallel discs.

a. *Axis in magnetic meridian.*

7. When the disc was in the meridian, the currents produced a slight tendency in the needle* to move in the same direction as the upper part of the ring.

8. When the disc was in the equator, the slight tendency was opposite to that in Exp. 7, and the same as if it had been produced by induced electricity in the ring.

9. When the disc was inclined to the meridian, there was a marked polarity, perpendicular to the disc.

b. *Axis in magnetic equator.*

10. The disc being placed in the meridian, there was no disturbing current.

11. Placing the disc equatorially, the needle was still undisturbed.

12. But when the disc was inclined to the meridian, the current-polarity was parallel to the disc.

c. *Axis* 45° *from magnetic meridian.*

13. In nearly all positions of the disc there appears to be a disposition in the needle to move *from* the axis of the ring. But when the disc is in or very near the meridian, there is a slight tendency towards the axis.

In order to imitate more closely the earth's principal thermal radiation-planes, which are all theoretically parallel with the thermal meridians and meet at the thermal pole, I constructed a compound disc (*l*) of two circular segments, inclined to each other at an angle of about 30°, with which I tried the following experiments:

B. Spherical-angular disc.

a. *Axis in magnetic meridian.*

14. If the disc is so placed, with its opening towards the south, that its angle is bisected by the meridian, the current-polarity carries the needle in the same direction as the motion of the top of the ring.

15. If the opening of the disc is turned to the north, the apparatus remaining in other respects as in the last experiment, the current-polarity is reversed (as in Exp. 8).

16. Placing the disc equatorially, I am unable to discover any current-polarity.

* In speaking of the needle's tendency, I always refer to the motion of the N. pole.

17. Inclining the disc towards N. W. and S. E., the needle moves towards the east, whether the opening of the disc is towards the north or towards the south.

18. If the inclination is towards N. E. and S. W., the motion of the needle is westerly.

Experiments 14 to 18 are perhaps the most interesting and important of the entire series. Exp. 14 represents the direction of the gravitation-currents that tend to restore the equilibrium which is continually disturbed by the thermal radiation of the northern hemisphere; while Exp. 15 represents the like direction in the southern hemisphere, and all the experiments demonstrate that *in the daily magnetic fluctuations, the motion of that end of the needle which is nearest to the equator should follow, precisely as observation shows that it does follow, the direction of the sun's meridional influence.*

b. *Axis in magnetic equator.*

19. When the disc is in the meridian, the current-polarity and the magnetic polarity coincide.

20. If the disc is in the equator, with the opening to the east, when the top of the ring moves towards the north the needle declines to the east.

21. But when the motion of the ring is towards the south, the current-polarity is reversed, and the needle declines to the west.

22. The reversal of the disc, placing the opening to the west, likewise reverses the polarity, the declination being east when the ring moves south, and west when the ring moves north.

23. The disc being inclined to N. W. and S. E., the needle declines towards the west (the action in Exp. 17 being reversed).

24. Changing the inclination of the disc to N. E. and S. W., the declination changes to east (reverse of Exp. 18).

From Exp. 19 to 24 we may infer that, *in consequence of the action of the trade-winds, combined with the greater radiation of the northern hemisphere, there should be a constant eastward tendency of the magnetic declination, such as is indicated by the secular variation of the needle.*

c. *Axis* 45° *from magnetic meridian.*

25. When the disc is in or near the meridian, there is a slight tendency, in the extremity of the needle which is under the opening of the disc, to follow the direction of the top of the ring. In all other positions, the needle declines *from* the axis.

d. *Axis variously inclined.*

26. If the inclination of the axis to the meridian is less, or greater, than 45°, the results approximate respectively to those obtained when the axis is in the meridian, and when it is in the equator.

C. Apparatus-Polarity.

Friction and the jarring of the apparatus, modified by the degree of velocity imparted to the ring, produce a polarity of their own which should be carefully estimated, and due allowance made for its influence in all delicate and doubtful experiments. In order to determine the directivity of the normal vibrations, independent of any mere current influence, the needle was shielded by a glass, as in the ordinary surveyor's or mariner's compass.

27. When the axis is in the meridian, the polarity appears to be meridional.

28. With the axis in the equator, the polarity is also meridional.

29. If the northern extremity of the axis is inclined to the west, the needle declines to the east.

30. Giving the axis an easterly inclination, the needle declines to the west. The declination is, therefore, *from* the axis in all cases, and we may infer that the earth's rotation exerts a constant tendency to increase the normal declination of the needle.

31. In all positions of the axis there appears to be a slight disposition in the needle to decline to the east, independent of the motion produced by the mere vibration of the apparatus. If this disposition is owing to terrestrial currents, it is probable that the declination would be westward in the southern hemisphere, in accordance with Ferrel's law, that, "*in whatever direction a body moves on the surface of the earth, there is a force arising from the earth's rotation which deflects it to the right in the northern hemisphere, but to the left in the southern.*" (Math. Monthly, i, 307.)

32. If a candle-flame, or the smoke of an extinguished taper, be brought near to the revolving ring, it will be repelled from the equator, attracted to the poles, and neither attracted nor repelled at a distance of about 30° from the equator.

33. If a magnetic needle is substituted for the taper, it tends to parallelism with the axis at the equator, and dips towards the centre as it approaches the poles, in accordance with its general disposition to range itself in the line of strongest vibration. (Exp. 3, Proc. A. P. S., ix, 359.)

D. Revolving Discs attached to the Ring.

a. *Discs Axial.*

34. Whatever may be the position of the axis, there is a very slight axial polarity.

b. *Discs Perpendicular to Axis.*

35. There is no current-polarity.

c. *Discs with* 45° *East Declination.*

36. If the axis is in the meridian, the needle declines to the east.

37. If the axis is in the equator, when the top of the ring moves south the needle declines to the east, but when the ring moves north the declination is westerly.

38. If the axis is inclined to the meridian, and the disc passes over the needle in the magnetic equator, the declination is easterly; but if the disc is meridional, I am unable to discover any decided current-polarity.

d. *Discs with* 45° *West Declination.*

39. Placing the axis in the meridian, the needle declines to the west.

40. When the axis is equatorial, the declination is westerly.

41. When the axis is inclined to the meridian, and the disc is equatorial, the needle declines to the west; but if the disc is meridional, it produces no marked polarity.

42. All of the experiments with revolving discs, as well as many of those with fixed discs, appear to be affected by changes in the earth-currents, especially when the motion of the ring is northerly.

The foregoing results are in precise accordance with the theoretical deductions contained in my papers on the "Numerical Relations of Gravity and Magnetism," on the "Influence of Gravity on Magnetic Declination," and on "Gravity and Magnetic Inclination" (Amer. Phil. Soc., Dec. 16, 1864, April 21 and May 19, 1865, and Amer. Jour. of Science [2], xxxix, 312; xl, 83, 166), as well as with Dove's discovery that analogous atmospheric states are more frequently found under the same meridian than under the same parallel, and with Ferrel's demonstrations of the tendency in fluids gyrating normally to move towards the pole, the parabolic route of cyclones, the lateral pressure of moving bodies, and the disposition

of the axis of rotating bodies to parallelism with the earth's axis.* (Math. Monthly, i, 307; ii, 95, 380, 382.) The rationale is generally so obvious that the necessity of the experiments may reasonably enough be doubted by some, while others may question the validity of any inferences as to magnetic motions that are drawn from the effect of impulses which are confessedly purely mechanical.

Such doubts may perhaps be removed by considering, 1st, the well-known danger of being led astray by the simplest undetected fallacy in *à priori* reasoning, which renders it desirable to obtain experimental verifications of every philosophical inference; 2d, that if all forms of force are, as is so generally supposed, mutually convertible, the convertibility can only be discovered through their mechanical momentum; and 3d, that *all the experiments illustrate the magnetic influence of a fluid controlled by the reaction of disturbed gravitation.* I have shown that forces proceeding in lines corresponding to those which represent solar and planetary† influence, produce magnetic deflections equivalent to the observed solar-diurnal, annual, decennial, and secular variations; and if it can be also shown that gravitation is an adequate force, we need seek no farther for a *vera causa*, or for conclusive evidence of the correlation of *all* the great cosmical forces.

Whatever theory we may favor respecting the nature of force, and the manner or medium of its transmission,—whether we consider with Fresnel and Grove, that the luminiferous and kinetic æther is material and ponderable; with Mossotti and Faraday, that it is imponderable; or with Dana, that the hypothesis of any medium is entirely supererogatory‡ (Amer. Jour. of Science [2], iv, 379, 382), it will be generally admitted that the quantity of motion is the proper measure of force. In an ordinary tempest, every flash of lightning is followed by a thunder-clap, which is occasioned by the

* Mr. Ferrel refers, for a beautiful illustration of some of his propositions, to Foucault's experiments with the gyroscope. (Amer. Jour. of Science [2], xv, 263; xix, 141.)

† The connection which has been pointed out by Sabine between Schwabe's theoretic course of the solar-spot phenomenon and the magnetic 10–11-year period (Phil. Trans., 1852, Art. VIII), acquires a new interest from Prof. Wolf's continued investigations into the influence of the several planets upon the sun-spot curve. (See Monthly Notices of the Royal Ast. Soc., May 12, 1865.)

‡ Is the "*pulsating molecular force*" of Prof. Dana's hypothesis material or immaterial? If the latter, is it intelligent or unintelligent? How can momentum be imparted by velocity without material mass, unless it be by the direct and voluntary act of a competent intelligence?

reacting gravitation of the air in the restoration of disturbed equilibrium; and, on the other hand, in water-spouts and tornadoes, the flashes seem to follow, instead of preceding, the equalizing action of aerial gravitation. We have never yet been able to measure the electrical and gravitating momenta in such instances of violent commotion; but we can hardly doubt their exact equivalence, in view of the well-established law, that "action and reaction are always equal and in opposite directions." And in consideration of such probable equivalence, it does not seem unreasonable to quote them as standing evidences of that long-desiderated link in the chain of kinetic unity, for the recognition of which the way has been partially prepared by Henry's discovery of the tendency to equality of electric momenta, and the correlation of intensity- and quantity-currents (Amer. Jour. of Science [1], xxxviii, 218), Challis's hydrodynamic researches (Phil. Mag., vol. i, sqq.), especially in their application to the explanation of gravity as a necessary resultant of universal æthereal vibrations (ibid. [4], xviii, 321, 443), Helmholtz's paper, "in which he has pointed out that the lines of fluid motion are arranged according to the same laws as the lines of magnetic force, the path of an electric current corresponding to a line of axes of those particles of the fluid which are in a state of rotation" (Crelle's Journal for 1859, referred to by Prof. Maxwell in Phil. Mag. [4], xxi, 348), Rankine's "Summary of the Properties of Certain Stream Lines" (Phil. Mag., Oct. 1864, pp. 282–8), Norton's recent articles on "Molecular Physics" (Amer. Jour. of Science [2], vol. 38, sqq.), and a variety of other physical discussions, some of which I have already cited.

The analogies which were pointed out by Gen. Sabine between the thermal and magnetic curves (Hobarton Obs., I, xli; Toronto Obs., I, xxxviii; St. Helena Obs., I, 38, &c. &c.), have been very fully, and, generally speaking, satisfactorily discussed by Profs. Norton (Amer. Jour. of Science [2], vols. 4, 8, 10, 19, 20) and Secchi (Phil. Mag. [4], vols. 8, 9), the former directing his attention exclusively to the correspondence between the magnetic and thermal variations, the latter to a hypothetical specific magnetism resident in the sun. *All of the reasoning of both these distinguished physicists can be applied, even more convincingly, in support of the hypothesis that simple gravitation-disturbances correspond to those of magnetism, and many of the difficulties in the way of other theories disappear before such an application.*

Having established the coincidence and equivalence (with opposite signs) of the magnetic and gravitating lines of force (Trans.

A. P. S., vol. xiii, Art. VI), the modifying magnetic influence of rotation (ibid., pp. 120, 129), barometric tides (ibid., pp. 123–7), winds (ibid., p. 121, and Proc. A. P. S., x, 104), thermal changes (Gen. Sabine, loc. cit.), and lunar attraction (Proc. A. P. S., ix, 434–8; Trans. A. P. S., xiii, 129; and Gen. Sabine's Diagrams, Toronto Obs., vol. iii, plate 2), and the probable, if not certain, dependence of the variations of long period upon trade-winds (supra, Exp., 19–24) and planetary positions (Sabine and Wolf, loc. cit.), the hypothesis of any peculiar magnetic æther, electric currents, or specific solar and lunar magnetism, to explain the normal perturbations of the needle, appears to be entirely superfluous and unphilosophical. Every particle of the earth's atmosphere is continually receiving and imparting the heat which is radiated from the earth and sun, its specific gravity constantly changing in such manner as to produce incessant rapid and short oscillations, both in the planes of the earth's thermal meridians* and in the great circles which pass through the centres of the earth and sun. The consequent disturbance of equilibrium, which is still farther increased by the condensation of vapor, the sun's direct attraction, and the earth's rotation, is counterbalanced by terrestrial attraction, acting most forcibly where the sun is in the horizon, and with the least relative efficiency when the sun is in the zenith (or at noon in the summer solstice, provided the station is extra-tropical).

The pressure thus exerted varies from 0 lb. to 15 lb. per square inch. Taking the mean (7½ lb. per square inch or 1080 lb. per square foot) as the average equilibrating tendency, we have a force nearly fifteen times as great as that which produces, and more than twenty-eight times as great as that which is produced by, a violent hurricane. (Ency. Britan., 8th edit., xiv, 647.) Only an insignificant portion of this mighty energy is exerted in the production of the various atmospheric currents, the remainder being quietly transmitted from molecule to molecule, and manifesting itself in barometric,† magnetic, and other meteorological perturbations. The adequacy of our supposed cause will therefore hardly be doubted; and, since its penetrating, pervading influence can be impeded by no material shield or screen, the demonstration of a correlation of heat and magnetism

* The earth's most powerful radiation is vertical, or in radial lines; next in intensity is the radiation towards the thermal poles, or along the thermal meridians; on the isothermal parallels, the radiation is comparatively insignificant.

† The morning and evening maxima and the noon minimum of effective pressure, combined with rotation, are the principal causes of the daily barometric tides.

with the force which keeps the planets in their orbits appears to be complete and conclusive.

It is possible that a careful study of the relation of the winds to the various magnetic variations would bring to light other evidences of parallelism as striking as the one I have already pointed out (Proc. A. P. S., x, 104) between the curves of vertical magnetic force and force of wind. Such a study might require special attention to the pressure and velocity of the wind, the times of maxima and minima, and other particulars, the need of which would be suggested by experience.

Whatever cause affects at the same instant the magnetic and aerial currents should first manifest itself through its influence upon the needle, on account of the amount of inertia in the air. Upon examining the second volume of the St. Helena Observations, which contains a record of the direction of the wind at intervals of six hours, so arranged as to facilitate a comparison with the magnetic declination, I find in each year, from 1844 to 1847 inclusive, that at one hour before the observation of the wind (and in each year except 1846, at the hour of observation) there was a greater average westerly declination when the wind was nearly east than when it was nearly S. by E. This is shown by the following table, which embraces all the tabulated instances when the wind was E. by N., E., E. by S., or S. S. E., S. by E., or S.

The variation of declination is ascertained, 1st, by subtracting from the observed declination the monthly mean at the same hour; 2d, subtracting the monthly average of the daily means from the mean variation of the day; and 3d, subtracting the latter result from the former. One scale division of the declinometer = 0′.711. Increasing numbers denote decreasing westerly declination.

Year.	E. by N., E., or E. by S.					S. S. E., S. by E., or S.		
	No. of observations.	Var. of decl'n. 1 h. before obs. Scale divisions	Average.	Var. of decl'n. at h. of obs. Scale divisions	Average.	No. of observations.	Var. of decl'n. 1 h. before obs. Scale divisions	Average.
1844	11	—5.11	—.46	—10.66	—.97	81	+4.77	+.06
1845	10	—3.09	—.31	—.52	—.05	283	—18.28	—.06
1846	20	—1.16	—.06	+4.37	+.22	191	+6.78	+.03
1847*	85	—4.96	—.06	—12.95	—.15	12	+1.52	+.12
Total	126	—14.32	—.11	—19.76	—.16	567	—5.21	—.01

* January to July inclusive.

The recent experiments of Marcus, showing the direct conversion of heat into electricity (see London Chemical News, No. 286; Journal of the Franklin Institute, No. 478), the well-known atmospheric daily cycles, with two maxima and two minima of electrical intensity,* and the tendency of the disturbance-variations of declination, inclination, and total force, to fluctuations which follow the solar-tidal and barometric-tidal hours,† are all noteworthy in this connection.

In the regions of variable winds, it can hardly be supposed that the correspondence between changes of wind and of declination should be so marked as in the torrid zone. I find, however, upon tabulating about two thousand of the Toronto Observations, that there are some indications of a similar character to those in the St. Helena Table; but they are, comparatively, so slight, that another form of comparison has given results which are more satisfactory to my own mind.‡

According to my several hypotheses, the magnetic impulses are transmitted with a velocity analogous to that of light, and the position of the needle at any moment is dependent upon the combined action of local and cosmical forces, the former producing continual agitations of short period, and the latter largely preponderating in the daily means. On the other hand, the barometric and other atmospheric changes, in consequence of greater inertia, are more obedient to cumulative influences that have a limited local origin, and less affected by sudden violent disturbances. It seems reasonable, therefore, to suppose that the oscillations about the mean magnetic values should differ, in duration and in other respects, from those about the thermal and barometric means. If their mutual relations are much obscured in consequence of this difference, any lingering evidences of inter-dependence that we may find may be entitled to great weight.

* For some recent interesting observations upon atmospheric electricity, see communications of Dr. A. Wislizenus in the Transactions of the Academy of Sciences, St. Louis.

† The long series of observations at Toronto show this correspondence in a very striking manner. See Gen. Sabine's Report, vol. iii, p. 63, table lvi.

‡ M. Kaemtz (Meteorology, Walker's translation, p. 451) states that "the dip depends, like the height of the barometer, on the direction of the wind and on temperature." This is the earliest intimation I have yet discovered, which can be possibly construed as either *implying* or tending to demonstrate a direct correlation between weight and magnetism. The resemblance between the curves of wind-force and magnetic vertical force, would naturally lead one to look to the dip rather than to the declination, for the most striking evidence of the magnetic effects of direction of the wind.

Taking Toronto as a typical station of average, and St. Helena as one of minimum accidental magnetic disturbance, I first deduced from three years' observations at each place (1843, '4, '5 at Toronto; 1843, '5, '6 at St. Helena; the observations of 1844 being comparatively incomplete), the average duration of the fluctuations of each element. I found the following mean lengths of an oscillation, measuring from the maximum of one wave to the maximum of the succeeding wave (B representing the barometer; T, thermometer; H, horizontal force; V, vertical force; D, declination).

	B.	T.	H.	V.	D.
Toronto,..	3.98 days.	3.93 days.	4.54 days.	4.31 days.	3.10 days.
St. Helena,	4.38 "	3.67 "	3.82 "	4.46 "	3.35 "

The mean wave-periods, taking the duration of the alternate variations above and below the monthly means, were as follows:

	B.	T.	H.	V.	D.
Toronto,..	2.91 days.	3.70 days.	4.55 days.	4.78 days.	2.32 days.
St. Helena,	3.76 "	3.86 "	4.34 "	5.51 "	3.27 "

By marking with the signs + and — the excess or deficiency of each daily mean, the monthly mean being assumed as the standard of comparison, I obtained the data for Tables I and II. The columns headed C contain the number of observations that present a correspondence (excess in one element accompanying excess in the other, and *vice versâ*), and those headed O give the number of instances in which there was an opposition of signs between the daily means indicated by the heading of each double column.

TABLE I.

Correlations of Temperature, Gravity, and Magnetism, in the Daily Means at Toronto.

	B. & T.		H. & V.		B. & H.		T. & H.		B. & V.		T. & V.		B. & D.		T. & D.	
	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.
	9	17	20	1	16	8	2	22	14	8	2	20	9	15	11	13
Jan.	5	22	..	..	18	9	6	21	..	..	..	..	14	13	10	17
	11	16	18	9	15	12	8	19	14	13	8	19	9	18	15	12
	11	13	8	13	11	11	13	8	14	10	2	22	14	10	11	13
Feb.	9	16	16	2	20	5	10	15	15	3	6	12	16	9	14	11
	6	18	20	4	16	8	6	18	18	6	2	22	15	8	4	19
	10	17	13	14	6	21	17	10	16	11	9	18	13	12	9	16
March.	12	14	18	8	10	16	10	16	12	14	4	22	16	10	10	16
	16	10	20	5	9	16	6	19	8	17	5	20	13	11	12	12
	9	15	4	20	10	14	18	6	18	6	4	20	19	5	11	13
April.	8	17	16	9	13	12	12	13	13	12	5	20	14	11	11	14
	14	12	26	0	12	14	2	24	12	14	2	24	14	12	6	20
	8	19	5	22	10	17	15	12	18	9	5	22	11	16	12	15
May.	7	20	19	7	16	10	6	20	16	11	6	21	17	10	9	18
	7	20	23	4	15	12	7	20	18	9	6	21	13	14	14	13
	11	15	4	22	13	13	20	6	13	13	2	24	12	14	13	13
June.	8	17	17	8	20	5	7	18	16	9	1	24	14	11	15	10
	6	19	14	10	20	5	5	20	16	8	9	15	11	14	14	11
	8	19	8	18	10	17	15	12	21	6	6	21	13	14	12	15
July.	9	18	14	13	17	10	5	22	10	17	10	17	19	8	11	16
	10	17	22	5	13	14	6	21	14	13	5	22	19	8	12	15
	11	16	14	13	17	10	11	16	20	7	6	21	16	11	8	19
August.	15	12	21	6	14	13	8	19	10	17	10	17	10	17	10	17
	8	18	8	18	18	8	6	20	8	18	22	4	16	10	12	14
	9	17	22	4	13	13	4	22	15	11	2	24	16	10	11	15
Sept.	9	16	22	3	17	8	3	22	18	7	2	23	12	13	12	13
	8	18	22	4	16	10	6	20	18	8	4	22	12	14	12	14
	8	18	7	4	15	9	3	21	6	6	3	9	13	13	12	14
Oct.	7	20	18	9	13	14	9	18	18	9	4	23	15	12	11	16
	4	23	23	4	20	7	7	20	18	9	5	22	17	10	10	17
	7	19	..	..	15	11	8	18	..	..	..	..	16	10	11	15
Nov.	13	13	18	8	18	8	7	19	15	11	6	20	15	11	8	18
	6	19	22	3	19	6	2	23	18	7	3	22	12	13	9	16
	12	13	..	..	18	7	9	16	..	..	..	..	15	10	10	15
Dec.	10	15	20	5	14	11	3	22	11	14	4	21	13	11	7	18
	9	17	22	4	16	10	5	21	16	10	1	25	13	13	8	18
1843.	113	198	105	131	154	151	135	169	155	87	41	201	167	140	131	176
1844.	112	200	199	78	190	121	86	225	154	124	58	220	175	136	128	184
1845.	105	207	240	70	189	122	66	245	178	132	72	238	164	145	128	181
Total,	330	605	544	279	533	394	287	639	487	343	171	659	506	421	387	541

TABLE II.

Correlations of Temperature, Gravity, and Magnetism, in the Daily Means at St. Helena.

	B. & T.		H. & V.		B. & H.		T. & H.		B. & V.		T. & V.		B. & D.		T. & D.	
	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.
	11	15	14	8	14	12	7	19	15	7	6	16	12	13	14	11
Jan.	17	10	14	12	11	16	10	17	13	14	11	16	13	14	11	16
	7	19	8	19	23	4	5	21	9	18	15	11	17	10	12	14
	13	11	15	8	12	12	9	15	8	15	5	18	12	12	13	11
Feb.	16	8	11	11	16	8	15	9	13	9	13	9	16	8	16	8
	10	14	12	12	12	12	4	20	8	16	8	16	9	15	11	13
	12	15	10	17	15	12	7	20	9	18	18	9	15	12	14	13
March.	11	14	15	10	8	17	16	9	14	11	16	9	13	12	15	10
	12	14	17	9	10	16	6	20	11	15	15	11	13	13	13	13
	21	4	4	20	10	15	10	15	19	5	19	5	13	12	15	10
April.	16	10	18	7	14	11	17	8	13	13	17	9	15	11	13	13
	9	16	3	16	12	13	12	13	8	11	15	4	10	15	10	15
	10	17	5	21	15	12	8	19	7	19	19	7	19	8	12	15
May.	10	17	6	20	20	7	5	22	7	19	19	7	12	15	17	10
	10	16	6	18	14	11	6	19	7	18	22	3	13	13	9	17
	10	16	5	20	21	5	11	15	10	15	19	6	15	11	15	11
June.	14	11	4	21	13	12	4	21	12	13	19	6	11	14	8	17
	12	14	8	15	18	8	8	18	10	13	10	13	15	11	19	7
	9	17	5	19	16	9	9	16	7	18	16	9	13	13	14	12
July.	12	15	14	13	14	13	9	18	13	14	18	9	14	13	17	10
	10	17	7	20	19	8	6	21	13	14	22	5	14	13	11	16
	5	22	3	23	20	7	6	21	7	19	20	6	16	11	10	17
August.	18	8	13	13	11	15	7	19	12	14	18	8	16	10	12	14
	8	18	14	11	17	9	11	15	7	18	17	8	12	13	15	10
	12	14	10	14	10	16	6	20	14	10	16	8	20	6	16	10
Sept.	15	11	11	15	9	17	8	18	14	12	19	7	12	14	7	19
	14	12	11	15	6	20	13	13	6	20	16	10	10	15	14	11
	16	10	18	6	10	16	6	20	11	13	4	20	18	8	14	12
Oct.	12	15	9	17	18	9	9	18	11	15	16	10	12	15	15	12
	11	16	9	18	16	11	12	15	16	11	20	7	16	10	12	14
	10	16	10	12	16	10	4	22	7	15	13	9	13	13	11	15
Nov.	12	13	7	18	14	11	9	16	10	15	15	10	15	10	12	13
	14	11	11	15	15	10	12	13	13	12	14	11	13	12	16	10
	9	16	17	8	18	7	8	17	12	13	8	17	16	8	11	13
Dec.	18	8	12	14	13	13	13	13	15	11	13	13	14	12	12	14
	14	11	15	10	7	18	6	19	7	18	12	13	7	17	8	16
1843.	138	173	116	176	177	133	91	219	126	167	163	130	182	127	159	150
1845.	171	140	134	171	161	149	122	188	147	160	194	113	163	148	155	156
1846.	131	178	121	178	169	140	101	207	115	184	186	112	149	157	150	156
Total,	440	491	371	525	507	422	314	614	388	511	543	355	494	432	464	462

Tabulating similarly the magnetic observations for one or two days prior and subsequent to the several thermometric and barometric fluctuations, I find indications of a continued action, which is paralleled by the ocean swell that remains after the subsidence of the winds by which the waves were originally excited.

In order to ascertain whether the correspondence, which is thus shown to exist between the daily means of the different elements, can also be traced in the hourly means, I noted the character of the undulations for several entire weeks, selecting observations at different seasons, in such a manner as I thought would give a pretty correct approximation to the average of each of three years. Considering the increasing waves as positive and the decreasing as negative, I obtained the data which are summarily detailed in Table III.

TABLE III.

Correlations of Temperature, Gravity, and Magnetism, in the Hourly Means at Toronto and St. Helena.

	B. & T.		H. & V.		B. & H.		T. & H.		B. & V.		T. & V.		B. & D.		T. & D.	
	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.	C.	O.
TORONTO.																
1st year.	197	242	208	188	212	232	227	232	201	176	162	229	225	211	195	260
2d "	202	234	170	202	246	217	197	234	188	173	165	192	225	217	189	238
3d "	191	232	171	128	218	211	192	259	155	125	120	172	230	202	200	248
Total,	590	708	549	518	676	660	616	725	544	474	447	593	680	630	584	746
ST. HELENA.																
1st year.	198	227	125	179	231	200	217	187	129	183	172	131	225	205	198	204
2d "	199	232	121	203	247	189	250	164	138	196	173	145	248	174	189	211
3d "	190	203	143	182	244	194	249	159	142	194	187	126	220	199	181	210
Total,	587	662	389	564	722	583	716	510	409	573	532	402	693	578	568	625

This triple comparison exhibits, in a very conclusive and satisfactory manner, a connection between temperature, gravity, and magnetic force, which, taken in conjunction with my previously adduced evidences of rotation-tides, appears sufficient to adequately explain all of the well-established normal meteorological fluctuations, and to give a clearer insight into the true meaning and value of the various partial relations which have been previously ascertained or surmised.

It is interesting, especially if we incline to adopt the common hypothesis that the barometric fluctuations are all owing, mainly, if not exclusively, to thermal disturbances, to observe that the magnetic force is more directly and powerfully affected by variations of temperature than the barometric pressure; and that at St. Helena the relation of the barometric to the thermometric movements is less marked than those of either the horizontal or vertical force to the fluctuations of gravity and of temperature. The relative preponderance of the rotation tide over the temperature tide at St. Helena (as shown by the barometer), is an additional evidence of the eligibility of that station for observing the correspondence between the fluctuations of magnetic force and the disturbances of gravitation.

In comparing the St. Helena and Toronto totals, five of the columns exhibit an opposition of relations, such as might have been anticipated, because the laws of equilibrium require that a disturbed "line of force" in one portion of the globe should be counterbalanced by an opposite line in another portion.

The analogies that have been pointed out by Sir David Brewster and Sir John Herschel, between the curves of terrestrial magnetism and those of the polarization of skylight, are a natural consequence of the mechanical laws which we have been considering. The special maximum which Herschel finds is so difficult to account for (Meteorology, p. 230), may be explained by the centripetal reaction against the centrifugal thermal and other solar disturbances, which is a maximum at 90° from the sun.

Pending nominations 540, 541, were read.

And the Society was adjourned.

Stated Meeting, October 20, 1865.

Present, twelve members.

Professor CRESSON, Vice-President, in the Chair.

Photographs of William D. Whitney and J. D. Whitney, members, were received.

Donations for the Library were received from the London Geographical and Geological Societies, Essex Institute, Philadelphia Academy of N. S., Henry C. Lea, the War Department at Washington, Messrs. Meek and Hayden, Rev. Albert Barnes, and C. M. Ellis, Esq.

The death of J. F. Encke, a member of the Society, at Spandau, Aug. 25th, 1865, aged 74, was announced by the Senior Secretary.

In consequence of the absence of all the members signing recommendations to membership, the election of members was postponed.

New nomination No. 542 was read.

On motion of Mr. Fraley the Secretaries and the Publication Committee were requested to report to the Finance Committee their liabilities for printing the Proceedings and Transactions, in order that appropriations may be made for paying the same.

And the Society was adjourned.

Stated Meeting, November 3, 1865.

Present, twelve members.

Dr. WOOD, President, in the Chair.

Letters of envoi were received from the R. A. at Madrid, dated April 20th, and 28th, the R. Geog. S. London, July,

and the New Hampshire Historical Society, Concord, Oct. 27th, 1865.

Letters of acknowledgment were received from the N. H. S., Emden, August 1st, and the R. Asiatic S. London, June 22d, 1865.

Letters acknowledging the receipts of their Certificates of membership were received from Geo. J. Brush, New Haven, October 4th, Thos. C. Porter, Lancaster, October 19th, and R. I. Ingersoll, October 28th, 1865.

Donations for the Library were reported from the R. A. at Lisbon, the Geographical, Antiquarian, Asiatic, Chemical, and Early English Text Societies at London, the Dublin Quarterly Journal of Science, Astronomer Royal Airy, New Hampshire State Agricultural Society, New Hampshire Historical Society, Franklin Institute, Captain W. F. Goodwin, and the Superintendent of the Girard Estate, Mr. C. S. Smith.

Dr. Gross, pursuant to appointment, presented an obituary notice of the late member, Charles W. Short, the reading of which was postponed to the following meeting.

Mr. Chase communicated certain observations on the magnetic observations at Toronto and St. Helena.

Prof. Cresson called attention to an article in the New Hampshire Agricultural Reports, stating that boiling water, applied to growing onions, will arrest the ravages of a maggot which attacks that bulb, without injury to the bulb from the hot water.

Prof. Cresson described also the discovery of fish in the water of a coal mine, which had no communication with any running stream upon the surface, except by percolation through a great thickness of rocks.

Dr. Wood mentioned the discovery of a number of Indian implements upon Cohansey Creek in New Jersey, among which was a spindle-shaped stone, probably the roller or pestle of a quern, for grinding food. Prof. Trego described a similar pestle of greenstone trap from Bucks County. Mr. Briggs described the use of such rollers by the Pueblo Indians now.

Mr. Briggs described, during a conversational discussion of waters impregnated with carbonate of lime, a recent patent for preventing incrustations upon steam boilers.

The subject of solidifying coal dust for fuel was then discussed by a number of the members present.

Pending nominations 540, 541, 542 were read.

On motion it was ordered that the Proceedings and the Transactions from the commencement of vol. xiii be sent to the New Hampshire Historical Society.

And the Society was adjourned.

Stated Meeting, November 17, 1865.

Present, fifteen members.

Dr. Wood, President, in the Chair.

Prof. Porter was introduced to the presiding officer and took his seat.

A letter from Mr. Robert Patterson to the Librarian, respecting a donation of books from his father's library, was read.

Donations for the Library were received from the Russian Academy, and Observatory, the Austrian Geographical Society, and Geological Institute, the Berlin Geological and Botanical Societies, the Emden Natural Historical Society, the Frankfort Zoological Society, the Royal Academy at Madrid, the London Astronomical and Antiquarian Societies, the Montreal Natural Historical Society, Mr. Walling, of New York, the Franklin Institute, and the Board of Trade of Chicago.

Dr. Gross read an obituary notice of the late Dr. Short, of Louisville, Kentucky.

The death of Judge Wm. L. Storrs, of Connecticut, was

made known to the Society, by a letter from Prof. Whitney, of New Haven.

Mr. Lesley communicated certain facts concerning the traditional smelting of lead by the aborigines.

Prof. Trego doubted the ability of the Indians to reduce galena, and their use or knowledge of lead, until the coming of the whites among them.

Prof. Porter described a remarkable locality within the city limits, on a reclaimed portion of the bank of the Delaware, below the Navy Yard, where, during the last two years, at least ninety species of perhaps seventy genera of plants have been discovered, belonging to the flora of the Carolinas, Florida, and other Gulf States, as far west as New Mexico, and some of them Western plants. They are divided into two groups, growing on the two banks of a narrow lagoon, one bank consisting of refuse heaps from the city, and the other bank formed by ballast heaps thrown from vessels trading coastwise with this port. Some of these botanical waifs have been discovered also growing on similar accumulations thrown upon the opposite or New Jersey shore.

Prof. Porter remarked that the native flora of this part of the United States was rapidly yielding to the inroads of a foreign flora, railroads appearing to be one of the most active agents of naturalization. Plants described by Dr. Gray as rare, have already taken complete possession of the valley of the Susquehanna, and the time may soon come when a large part of our flora will have a foreign character.

Prof. Trego described the sudden apparition of numerous plants, not indigenous to this locality, in the yard of the Moyamensing Prison, introduced, as was supposed, in the wool which the convicts used for manufacturing purposes. Other members testified to the rapidity with which the naturalization of plants is going on.

The minutes of the last meeting of the Board of Officers and members in council, were then read.

Pending nominations 541, 542, and new nominations 543, 544 were read.

Mr. Geo. Christian Schaeffer, lately elected a member, and

whose father, the Rev. C. Schaeffer, was a member of this Society, requested through Mr. Briggs that the proper correction should be made in the published spelling of his family name.

On motion of Dr. Le Conte, the bill of Bowen & Co., for three lithographic plates of Myriapoda, in the sum of three hundred and eighty-two dollars and seventy-two cents, was ordered to be paid by the Treasurer.

And the Society was adjourned.

OBITUARY NOTICE OF CHARLES WILKINS SHORT, M.D.

Dr. Short was born at Greenville, Woodford County, Kentucky, on the 6th of October, 1794. His father was Peyton Short, of Surry County, Virginia, whose mother, Elizabeth Skipwith, was the daughter of Sir William Skipwith, Baronet. His own mother was Mary Symmes, daughter of John Cleves Symmes, who removed from Long Island to Cincinnati, where, after having occupied various offices of trust and honor, he died in 1814. Dr. Short had, beside a brother and sister who both died in infancy, one brother, the late Judge John Cleves Short, and one sister, the wife of Dr. Benjamin Winslow Dudley, the eminent Kentucky surgeon. He had also several half brothers and sisters, his father having married a second time.

The early part of Dr. Short's life was marked by no event of particular importance. It was noted chiefly for his exemplary conduct and love of Nature, to the development of which the wild scenery of his native village was eminently conducive. With the pleasant memories of this much-loved home of his childhood his heart was filled to his dying day. It furnished the theme for youthful poems and the picture for his boyish pencil. Greenfield was for many years the country residence of his father, being a farm of several thousand acres, in one of the most beautiful and romantic regions of Kentucky, so distinguished for the variety and grandeur of its scenery. It was here, no doubt, that he first imbibed his love for the particular science which he afterwards cultivated with so much ardor and success, and which contributed so greatly not only to his happiness but his reputation.

His primary education was obtained at the school of Mr. Joshua Fry, a celebrated teacher, under whose training were reared some of

the most distinguished divines, physicians, lawyers, and statesmen of Kentucky. It was, in fact, for a long time the only male seminary of any importance in that State. What proficiency young Short made in his studies under the instruction of this gentleman, my information does not enable me to state; that it was highly respectable may be inferred, not only from the character of his mind and his habits of industry, but from the fact that, immediately after quitting him, he was admitted into Transylvania University at Lexington, where he was graduated, with considerable honor, in 1810. He was one of the speakers on commencement day, and his address on the occasion was very warmly applauded both by the faculty and the public.

Soon after the event just referred to, young Short began the study of medicine under his uncle, Dr. Frederick Ridgely, a gentleman of considerable scientific attainment, and for many years one of the leading practitioners of Kentucky. In 1813 he repaired to Philadelphia, where he became a private pupil of Dr. Caspar Wistar, Professor of Anatomy in the University of Pennsylvania. He remained in the office of this distinguished teacher until he was graduated in the Medical Department of this institution in the spring of 1815. The thesis which he presented on the occasion was on the medicinal virtues of *Juniperus Sabina*, and was treated with marked ability. During his residence in Philadelphia he was a diligent and zealous pupil, and devoted much attention to the study of botany, a branch of science in which he was destined to become so conspicuous. A warm attachment sprung up during this period between the professor and the pupil, which continued until the former died in 1818, universally beloved and honored, with a reputation coextensive with our continent. That such should have been the case is not surprising when we consider the character of the two men. Wistar was an eminently amiable man, of the most engaging manners and of remarkable conversational powers; he was the idol of his classes, and probably the most popular teacher of his day in this country. His social position was of the highest order, and he was the founder of the parties which have since borne his name, and which have contributed so much to the elevation of the social character of Philadelphia. His fondness for young men was proverbial; he encouraged them in their studies and aided them with his counsel and even with his purse. The letters which young Short brought with him from eminent citizens of the West secured him at once the *entrée* to his house; they saw each other constantly, and when the young backwoodsman at length left Philadelphia, his greatest regret was at

parting with his beloved preceptor and friend. As a proof of this attachment, I may mention that Dr. Wistar presented to his pupil a cherished case of eye instruments, the trusty companions of a long lifetime, which now, that his own eye was becoming dimmed with age, he hoped would be of service in restoring the sight of the blind in the hands of his promising young friend after his return to the wilds of Kentucky.

In November, 1815, Dr. Short was united in matrimony to Mary Henry Churchill, only child of Armistead and Jane Henry Churchill, the latter of whom, after the death of her husband, became the second wife of Mr. Peyton Short. This circumstance occurred while Charles W. Short, the subject of this sketch, and Mary H. Churchill were children, who were thus brought into the same family circle. Of this alliance, in every respect one of supreme happiness, six children survive, one son and five daughters, all of whom, excepting the youngest, are married, and in a prosperous condition.

Soon after his marriage he returned with his wife to Kentucky, travelling the entire distance in a spring wagon. The journey, although tedious and fatiguing, was replete with interest, on account of the beauty of the scenery along the route, and often formed the topic of pleasant reminiscences in after years. He now settled at Lexington, in his native State, but, not succeeding to his wishes, he shortly after removed to Hopkinsville, where he entered into partnership with Dr. Webber, and very soon obtained a large practice. It was while living here, in a wild, hilly, and romantic region of country, now highly cultivated and densely populated, that he devoted himself, with all the ardor of an enthusiast, to those botanical researches which formed the basis of his future reputation and the great source of his future happiness. No plant, or shrub, or tree escaped his notice. His daily rides through the country, rendered necessary by his practice, were invariably productive of some botanical trophies, which, carefully dried and preserved, thus assisted in laying the foundation of one of the richest and most valuable private herbariums ever collected in this or any other country. The researches in which he was thus so assiduously engaged soon brought him into favorable notice with scientific men, and served to establish for him a certain degree of reputation, apart from that of the mere practice of his profession, for which he seems never to have had any particular fondness.

In 1825 he was called to the chair of Materia Medica and Medical Botany in Transylvania University at Lexington, his former home. This school, then recently organized, was rapidly rising into distinc-

tion, and was destined eventually, though only for a short period, to occupy a very prominent position in the public eye. A wide field of glory and usefulness now lay before him, and he was not slow in availing himself of its advantages. Most of his associates in the school were men of mark and merit. Dr. Benjamin W. Dudley, his brother-in-law, the incumbent of the surgical chair, had already achieved a high reputation as a teacher and an operator; patients flocked to him from all parts of the Mississippi Valley, and in a short time he became the great lithotomist of America. His only rivals were Physick and Mott; but, owing to the great distance which separated him from them, they were so only in name. He was literally, for a number of years, "monarch of all he surveyed."

Dr. Charles Caldwell graced the chair of the Institutes of Medicine. A resident of Philadelphia, a man of great and varied talents, well read in and out of his profession, his fame had preceded him to Lexington; and it is but justice to say that he contributed most largely, by his writings and teachings, to build up and give temporary *éclat* to its medical school. His tongue and pen were never idle. A more majestic figure on the rostrum could hardly be imagined. Tall and erect in person, with a noble head and a piercing black eye, he was the *beau ideal* of an elegant, entertaining, and accomplished lecturer. He was eloquent, but too artificial, for he had cultivated elocution too much before the mirror.

Dr. Daniel Drake, afterwards so distinguished as a teacher and a writer, had only a few years before made his debut in public. Emphatically a self-made man, he possessed genius of a superior order, and successfully coped with his colleagues for the highest place in the school. Of all the medical teachers I have ever known he was, all things considered, one of the most able, captivating, and impressive. There was an earnestness, a fiery zeal about him in the lecture-room, which encircled his person, as it were, with a halo of glory. The great work which he has left behind him on the "Diseases of the Mississippi Valley," attests his industry and talents, and forms a monument to his memory as enduring as the vast region of country whose maladies he has so glowingly and faithfully portrayed.

Dr. Holley, a man of brilliant talents, elegant accomplishments, and superior literary attainments, was President of the University; and, although not immediately connected with the medical department, nevertheless exerted considerable influence on its destiny. Lexington, emphatically the garden spot of Kentucky, was at that time justly regarded as the "Athens of the West;" its University had high pretensions; it was the home of Henry Clay; its bar was famous

throughout the land; and its women were noted for their personal charms and great accomplishments.

With such men as his compeers, Dr. Short had every inducement for exertion; and there is reason to believe that, quiet and unostentatious as he was, he exercised no ordinary influence in sustaining the reputation of the University. His heart and soul were thoroughly in the work. The school soon rose to an unprecedented degree of prosperity, which it steadily maintained until the dissolution of its great Faculty in 1837.

In 1828 he founded, along with his colleague, Dr. John Esten Cooke, the "Transylvania Journal of Medicine and the Associate Sciences." With this publication, which for a long time wielded an important influence in moulding the opinions and practice of the great body of physicians of the Southwest, he continued his connection until the close of the fourth volume, zealously laboring for its interests and those of Transylvania University, whose prosperity it was more particularly designed to promote. In this periodical is to be found nearly everything that Dr. Short ever contributed to the public press.

In 1837, the Medical Department of Transylvania University, after a period of eighteen years of extended usefulness and remarkable fame, experienced a violent convulsion, which shook it to its very centre. Dissatisfaction of a serious character had existed for several years among some of the Faculty in regard to the manner of conducting its affairs. The school had grown too large for the place where it was located; there was a great dearth of anatomical material, and clinical instruction was, in great measure, neglected on account of the absence of hospital facilities. Owing to these circumstances a part of the Faculty withdrew, and accepted chairs in the medical school at Louisville, whither Dr. Short soon followed, although the Trustees of the University, upon reorganizing the Faculty, had reappointed him to his former situation.

In the University of Louisville, then a young but destined soon to be a gigantic institution, Short had the same chair as the one he had just vacated at Lexington. Here he quietly and unostentatiously pursued "the even tenor of his way," devoting himself to botanical researches and literary studies, and zealously co-operating with his distinguished colleagues, of whom the great Drake was again one, in promoting the interests and prosperity of the school, which soon rose to an extraordinary height, students flocking to it from all sections of the Mississippi Valley, until its spacious halls were completely crowded. The number of its pupils in 1847 was upwards of 400. Such

rapid success had never before been witnessed in any medical university on this continent.

Becoming tired of medical teaching, Dr. Short dissolved his connection with the Louisville school in 1849, and retired to Hayfield, a beautiful and charming residence five miles from the city. A more lovely spot than this could hardly be imagined. The dwelling, the former abode of a gentleman of taste and refinement, was an elegant mansion, with all the conveniencies of a city house. It was furnished in the best Kentucky style, and overlooked a rich lawn of almost perpetual verdure, such as might have charmed Calypso and her nymphs. It was surrounded by stately elm trees; close by was an immense spring of the coldest and most limpid water; the rear was skirted by a beautiful piece of woodland; and at one side was an ample garden, set out in shrubbery and plants, native and exotic, many of them set out by Dr. Short's own hands. The farm, comprising several hundred acres, was highly cultivated, and stocked with Southdown sheep and choice cattle. It was here, in the bosom of his family, that he spent the evening of his life, in the enjoyment of an elegant leisure, diversified by literary and scientific pursuits.

The country for miles around Hayfield is bewitchingly beautiful; it is thickly settled, and in a very high state of cultivation. The traveller, as he slowly winds his way along its public roads, is instinctively attracted by the magnificence of the landscape. The wildness of the natural scenery has given way to ample fields, intersected by elegant fences, and dotted with groves and dwellings, buried in shrubbery, or reposing under the foliage of widespread elms, oaks, and beeches. Here and there is a large mansion, or the neat New England cottage, the abode of wealth and elegant refinement; the whole forming a grand tableau, well calculated to warm the imagination and inspire the soul of a pastoral poet.

It had always been one of the cherished objects of his life to have a house in the country, such were his love of nature and his distaste of city excitement. Even during his residence at Louisville, where his winters were occupied with his college duties, his summers were devoted to the improvement of a pretty little place on the Ohio River, near North Bend, which he called "Fern Bank," from the fact that it abounded in plants of that name. Here with his family around him, in the neighborhood of the residence of a much-loved and only brother, his time was spent much more in accordance with his tastes than in the noise and bustle of the city.

His only patrimony, in early life, was a good name; but by untiring industry and economy he eventually accumulated a moderate but

independent fortune, which was considerably augmented, in 1849, by the death of his uncle, William Short, Esq., of Philadelphia, of whose estate he was one of the principal heirs. To this uncle Dr. Short was greatly attached; he made him not only frequent visits but maintained a constant correspondence with him, his letters, down to the time of his death, numbering upwards of five hundred. From a memorandum now before me it seems that he was a native of Virginia, having been born in Surry County in that State in 1759. "His life, public and private," records the tombstone erected to his memory at Laurel Hill Cemetery, "was distinguished by ability, probity and industry never questioned. He received from President Washington, with the unanimous approval of the Senate, the first appointment to public office conferred under the Constitution of the United States; and from President Jefferson, whose affectionate friendship he always largely possessed, proofs of similar confidence." Mr. Short lived for a considerable time in France, first as secretary to Mr. Jefferson, and afterwards as a private citizen. He was at Paris during the most eventful period in the history of France, and, indeed, of all Europe. As a citizen of Philadelphia, he occupied a prominent position, and enjoyed the confidence and esteem of a large circle of acquaintances and admiring friends.

His botanical researches brought Dr. Short in relation with many of the most distinguished scientific men of Europe and America. Prominent, among the former, were Sir William Hooker, director of the Royal Gardens at Kew, near London; De Candolle, of France; Joachim Steets, of Hamburg; Professor C. F. Meisner, of Switzerland; Uzrelli, of Italy; Thomas Nuttall and Mr. Wilson, of England. With Sir William Hooker, whose death at the age of eighty was only recently recorded, he was in constant communication for upwards of twenty years, and a large volume of his letters is now in the possession of the family. This correspondence, begun as a purely professional one, soon ripened into the most intimate intercourse, which manifested itself in various acts of kindness and the interchange of little mementoes, always gratifying to scientific men.

His American correspondents were too numerous to be mentioned. Among the most valued and distinguished were Asa Gray, Torrey, Darlington, Bachman, Agassiz, Engelmann, Audubon, Meade, Carey, Curtis, Lapham, and Durand. Dr. Gray was a warm friend of Dr. Short, and soon after his death he published in Silliman's Journal, a beautiful and appropriate tribute to his memory.

He was a member of various scientific societies, both foreign and domestic. After his death, a number of diplomas were found among

his papers, but so retiring was he in his disposition and habits, and so modest in his intercourse with the world, that no little difficulty was experienced in hunting up these honors, for which he seems to have cared very little.

"As a lecturer," says one who intimately knew him as a friend and colleague—Professor Henry Miller, of Louisville,—"his style was chaste, concise, and classical, and his manner always grave and dignified. His lectures were always carefully written, and read with a good voice and correct emphasis. He never made the least attempt at display, nor set a clap trap in all his life." His courteous deportment made him a favorite alike with his pupils and his colleagues, the latter of whom he served for a number of years, both at Lexington and Louisville, as Dean, an office of no little importance in a medical school. He hated controversy, and never engaged in any of the medical quarrels at one time so rife at these two places.

In stature Dr. Short was of medium height, well proportioned, with light hair and complexion, blue eyes, and an ample forehead. His features, when lighted up by a smile, were radiant with goodness and beneficence. In his manner he was graceful, calm, and dignified; so much so that one coming into his presence for the first time, might have supposed him to be haughty and ascetic; such, however, was not the case. A kinder heart never vibrated in a human breast. Naturally mild and amiable, he had all of a woman's gentleness, with a mind of inflexible firmness upon all questions of duty. Of a sensitive, diffident disposition, he rather shunned than courted society, and never appeared to greater advantage than in the bosom of his own family, or in the midst of a few select friends. As he advanced in life, he grew more serious, but never was morose or even cynical. The sanctity of his heart was never invaded by such a feeling. He had studied God and man too closely; had enjoyed too great a degree of happiness and prosperity to cherish such a sentiment, or to exhibit such a trait in his intercourse with the world. I have the testimony of one who knew him well and intimately that he never saw any person who enjoyed more heartily an agreeable anecdote, or an innocent and amusing story. All his impulses, in fact, were of the noblest and most generous nature. The poor never knocked at the door of his heart without a prompt response. His moral character was untarnished. No one ever dared to impugn his motives, or to call in question the purity of his acts. As has been well observed by one of his scientific friends, he had an uncompromising sense of justice, and a keen hatred of everything mean and unworthy. He was a model man; a model philosopher; a model Christian. As a husband and father, his

character reached perfection as nearly as is, perhaps, possible. His family not only loved, but revered him. His children often accompanied him in his botanical excursions, and assisted him in drying and arranging his specimens. One of his daughters, in referring to these labors, assures me that many of the happiest recollections of her childhood are connected with these excursions. "To those," she continues, "who met my father as colleagues, or as mere acquaintances, but little was known of his character in domestic life; only those who were the recipients of his deep affection, as wife and children, can form even a faint idea of his goodness. His home was truly his heaven on earth."

In his relation to those who were placed by Providence under his charge as servants, he was truly "the friend in need;" he treated them with real parental kindness, and spared no pains to improve their moral and religious character. Soon after he moved to Hayfield, three old negroes, once the property of his father, sought his care and protection, in order that they might die under his hospitable roof. Two of them had been free for thirty years.

In regard to his religious views, Dr. Short connected himself early in life with the Presbyterian Church, of which he remained a faithful and consistent member up to the time of his death. He made no ostentatious parade of his piety. The same retiring disposition, the same modesty and gentle demeanor that characterized his outer-life, attended him here. Without entering into details, it may be stated that there is every reason to believe that he rendered to his God a good account of the talents committed to his keeping. His very profession, as a practical botanist, brought him in daily communion with the Creator. A naturalist can neither be a skeptic nor a bad man. He finds a sermon in every plant, in every stone, in every living thing. The direct tendency of the study of the sciences, of botany in particular, is to refine and humanize our tastes, and to inspire us with love and reverence for the Deity. "Consider the lilies of the field how they grow; they toil not, neither do they spin; and yet I say unto you that Solomon in all his glory was not arrayed like one of these." Botany is emphatically the poetry of the sciences, or, as has been beautifully remarked by one of its most able and successful cultivators, "the amiable science."

When Dr. Short left the University of Louisville, the Board of Trustees, at once, as a just tribute to his long and faithful services, elected him Emeritus Professor of Materia Medica and Medical Botany; while his colleagues united in a complimentary letter, expressive of their warm personal regard, and of their hope that he

might find in his retirement the ease and comfort for which he had so long sighed.

He was now in the fifty-fifth year of his age, with all his faculties, mental and corporeal, in full vigor. It was believed that one of the objects he had in view in quitting the school was to write a work on the botany of the Southwestern States, for which he had long been engaged in collecting material. His herbarium was one of the most extensive and complete in the country, and few, if any, were so thoroughly and intimately acquainted with its flora. With descriptive powers of a high order, with leisure at once elegant and refined, with a scholarly mind and independent wealth, he was capable of producing a work of the most profound interest and value, replete in originality and calculated to reflect vast credit, not only upon himself as an able and finished botanist, but upon the scientific character of the nation. He might, in a word, have effected for his favorite science what Wilson and Audubon so happily effected for ornithology. But, strange to say, he never accomplished his purpose. He seemed to be afraid to enter upon the task. Writing was distasteful to him, and his days and nights passed without yielding any scientific fruits. His vast collection of dried specimens, one of the richest of the kind in the world, is now in the possession of the Academy of Natural Sciences of Philadelphia; and other hands than his will, doubtless, ultimately delineate and describe it. It was originally bequeathed to the Smithsonian Institution at Washington, but as there was no suitable apartment for its preservation, it was fortunately sent to this city, whose scientific men cannot fail to appreciate its value and importance, and to render it ultimately available to the permanent fame of its author.

Most of Dr. Short's time during his residence at Hayfield, was spent in his herbarium, a model of elegance and neatness. It was, in fact, his daily study, absorbing nearly all his attention, especially in the winter. Here, year after year, he prepared, arranged and labelled his specimens, receiving and sending collections to all parts of the civilized globe, mainly through the hands of European botanists, and they through their colonies in more remote regions. In this labor, one of love and almost of necessity to him, he was often assisted by his daughters, many of whose happiest moments were thus spent in his presence, under circumstances of the most gratifying and delightful nature. The labels used upon his specimens were generally printed by their own hands by means of a small home-made press.

In summer his garden afforded him great delight in the planting

and propagation of various plants and trees, which he often watched with the most tender care and the greatest interest. Neither Wilson nor Audubon ever watched a bird with more solicitude than he his flowers. His garden was spread over several acres, and few persons visited Hayfield without an introduction to it. For the more commonplace routine of his farm he had little or no taste, although it was one of the most magnificent in Kentucky. A general superintendence was all the attention he bestowed upon it.

Thus were his latter days passed—in the garden in summer, in the herbarium in winter—until about two years before his death, when he was seized with great debility and ennui, and seemed to have lost, in a great degree, his interest in things around him. His last illness was pneumonia, which soon assumed a typhoid form, and terminated his valuable life on the 7th of March, 1863, in the sixty-ninth year of his age. He sank away so quietly and calmly that the friends who watched him scarcely knew when the spirit fled. His remains repose in Cave Hill Cemetery, near Louisville.

The name of Dr. Short is commemorated by a number of plants, a list of which has been kindly furnished me by Mr. Durand, of this city, himself an able and accomplished botanist.

1st. *Genus Shortia*, founded by Professor Asa Gray, on a plant of the *Pyrola* family, discovered by Michaux on the mountains of North Carolina.

2d. A cruciferous plant, *Vesicaria Shortii*, described by Professor Torrey, and discovered by Dr. Short on the banks of Elkhorn Creek, Lexington, Kentucky.

3d. A leguminous plant, *Phaca Shortiana* of Nuttall, found in Missouri.

4th. *Aster Shortii*, so named by Boott, growing in Ohio, Wisconsin, and other regions.

5th. *Solidago Shortii*, of Torrey and Gray, discovered at the Falls of the Ohio.

6th. *Carex Shortiana* of Dewey, extending from Southern Pennsylvania beyond Illinois.

It will thus be seen that five eminent botanists have paid a just tribute to one whom they honored as an able and indefatigable laborer in the same field of science which they themselves have so earnestly and successfully cultivated. A stronger proof than this of the high appreciation and affectionate regard in which Dr. Short was held by them, could not be afforded. They seemed to have vied with each other to gratify him during his lifetime, and to perpetuate his name

and fame after his death. Such acts are a beautiful reflection of the purity and unselfishness of the soul of science.

His love for his favorite science was so great, his desire for a diffusion of its knowledge so ardent, that he gave away not only all that he could spare from his own magnificent herbarium, but was a constant subscriber to all the North American collections within his reach. He planned and effectually aided several distant and difficult botanical explorations; and he purchased, at a liberal price, the rich herbarium of Berlandier, the fruit of extensive researches in Texas and Mexico.

He had a large and select library, containing about 3000 volumes, one-fourth of which were rare and costly botanical works, of which he was very fond. He possessed a fine literary taste, and always perused the choicest books. He had, however, a higher opinion of the authors of the past than those of the present generation, esteeming Fielding and Sir Walter Scott as far superior to the moderns. The latter was his great favorite; he had the best editions of his works, and a volume of them was always to be found upon his table. Several magnificent engravings of Sir Walter hung about the house, and he was very familiar with his life and character as drawn by Lockhart. Notwithstanding his love of classical and scientific knowledge, he was very fond of mechanical pursuits, and often amused himself in binding his loose papers into volumes, constructing the wooden cases for his plants, and making various little alterations and repairs about the place.

The writings of Dr. Short are extremely limited. If collected in book-form they would hardly fill a duodecimo volume of three hundred pages. They relate, for the most part, to botanical topics, and consist principally of articles contributed to the "Transylvania Journal of Medicine," of which, as already stated, he was for some time an editor. They all evince the accuracy and good taste which he carried into everything he attempted. In 1826, soon after his appointment to the chair of Materia Medica in Transylvania University, he commenced, in that journal, the publication of a series of papers designed to illustrate the nature of the vegetable productions of the neighborhood of Lexington and the circumjacent parts of Kentucky. He became particularly impressed with the want of such a guide while engaged, during the previous summer, in delivering, to a small class of students, a course of lectures on botany. His object was to furnish a complete local flora, similar in principle to that of Dr. Darlington, of the plants of West Chester, Pennsylvania. The only two systematic treatises on American botany then extant were those

of the elder Michaux and of Pursh, the former published at Paris in 1803, the latter at London in 1814. The works of Bigelow, Barton, and Darlington, issued at a later period, were of a purely local character, and could therefore be of no special service to Western pupils. The papers thus commenced were continued until 1845.

The next article from his pen was one on the "Cultivation of certain Medicinal Plants," in which he drew the attention of the profession to the importance of cultivating various substances of the materia medica, such, for example, as digitalis, senna, poppy, and castor oil, with a view of securing a more reliable supply of drugs. The subject had engaged much of his reflection, and he expressed great confidence in our ability to furnish these and other articles of superior quality.

"Notices of Western Botany and Conchology,"—a paper jointly published by himself and Mr. H. Halbert Eaton—appeared in 1830, in the fourth volume of the Transylvania Journal. They comprise a brief account of the plants found between Lexington and the Ohio River, a distance of about eighty miles, traversed by the explorers for the most part on foot. As the season was unusually dry, an excellent opportunity was afforded them of examining the shells of this celebrated stream, and also of the contiguous portions of the Great Miami River. Hardly two years had elapsed from the time of this agreeable and instructive ramble when Dr. Short was called upon to mourn the death of his associate, a man of extraordinary promise as a naturalist, and universally beloved and esteemed for his amiable and social qualities. In an address, delivered at the opening of the session of the Transylvania University in 1832, Dr. Short pronounced a feeling and eloquent eulogy upon his life and character. Mr. Eaton was quite young at the time of his death. His zeal in the pursuit of science had early lighted the fire which consumed him. "Science' self destroyed her favorite son."

Soon after this he published an elaborate paper, entitled "Instructions for the Gathering and Preservation of Plants in Herbaria," in which he depicts, in glowing terms and at full length, the manual labor of a botanist in forming his collection, and in arranging and labelling his specimens. Appearing, as it did, at a period when very little was known upon those subjects in this country, it must have been of great service to the young men engaged in this pursuit, so delightful and invigorating alike to mind and body. What student of Nature is there that cannot appreciate the feeling so eloquently expressed by the great and good Elliott, one who himself so often worshipped at her shrine, in the following sentence: "The

study of natural history," says he, "has been for many years the occupation of my leisure moments; it is a merited tribute to say that it has lightened for me many a heavy and smoothed many a rugged hour; that, beguiled by its charms, I have found no road solitary, rough or difficult, no journey tedious, no country desolate or barren. In solitude never solitary, in a desert never without employment, I have found it a relief from the languor of idleness, the pressure of business, and the unavoidable calamities of life."

In 1836 he contributed an article on Botanical Bibliography, comprising a notice of some of the more recent treatises on American botany. When this paper was published upwards of twenty years had elapsed since he had entered upon his favorite study with hardly any works to guide him. Now he was able to refer the young votary to the admirable productions of Torrey, Drummond, Hooker, Beck, Gray, and others; men who, like himself, have accomplished so much in diffusing a taste for the cultivation of this "amiable science," and whose names will be forever honorably associated with the progress of natural history in the United States.

The Bibliographia Botanica was speedily followed by "A Second Supplementary Catalogue of the Plants of Kentucky," a paper based upon his botanical explorations of that State in 1835, and embracing an account of nearly two hundred species added to the number previously described by him. A considerable number of these plants had either been unknown or had never been introduced into any of the systematic treatises on American botany.

Then followed a "Sketch of the Progress of Botany in Western America," a short but most instructive article, affording a full account of the improvements in our botanical knowledge since the commencement of the present century. The interest of the article is greatly enhanced by the fact that it is interspersed with brief sketches of the lives and services of our most distinguished botanists. Soon after this appeared his "Third Supplementary Catalogue of the Plants of Kentucky," comprising a brief description of the plants observed by him since the publication of his former contributions to the subject.

In 1845 he wrote a paper, entitled "Observations on the Botany of Illinois." It was addressed, in the form of a letter, to one of his colleagues, Dr. Drake, and was published in the "Western Journal of Medicine and Surgery," edited by that distinguished teacher and philosopher. It was, if I do not err, his last contribution to a medical periodical,—probably the last he ever composed. It was written with special reference to the autumnal flora of the prairies. In the

journey which he undertook for the purpose, and which was performed in the latter part of summer, Dr. Short was accompanied by his brother and several intimate friends, on account of the interest they took in the objects of the tour. He travelled in a light covered wagon, purposely constructed for the accommodation of an extensive collection, and he was constantly on the lookout for everything of interest. He passed over a distance of nearly four hundred miles, including the best portion of the State of Illinois, and returned, late in the season, laden with botanical treasures. The emotions he experienced on beholding, for the first time, a large prairie, is thus graphically described: "On reaching the centre of one of these immense natural meadows, the view presented to the eye of a novice in such scenery is one of the most pleasing sort. But beautiful, imposing, and grand as is this spectacle, I must own that, in a botanical point of view, I was disappointed! The flora of the prairies—the theme of so much admiration to those who view them with an ordinary eye—does not, when closely examined by the botanist, present that deep interest and attraction which he has been led to expect. The leading feature is rather the unbounded profusion with which a few species occur in certain localities than the mixed variety of many different species occurring everywhere." Certain plants seemed to monopolize, if such an expression be allowable, certain districts, extending, perhaps, over thousands of acres, and exhibiting the appearance of a vast flowering garden, of almost every shade of color, from the purest white to the deepest yellow, red, or purple. What particularly struck him was the remarkable absence of ferns, and the astonishing paucity of mosses, in these prairies. Of the former he did not meet with a single specimen of any species of the extensive tribe in the more open meadows,—a circumstance evidently due, as he supposed, to the want of shade and moisture in which most of these plants so much delight.

The above catalogue comprises, so far as I know, all, or nearly all, that Dr. Short ever wrote upon botany. His other writings consisted mainly, if not wholly, of medical cases and college addresses.

In 1830, he communicated to the Transylvania Journal of Medicine the particulars of a case, then considered as very curious, of spontaneous combustion of the human body. The subject was a female, of intemperate habits, upwards of sixty-five years of age. Without fully indorsing the idea of the possibility of such an occurrence, he expressed the opinion that it was an example of a more general destruction of the human body by caloric than could easily be explained upon ordinary principles, or the amount of combustible material present on the

occasion. The whole question relative to this subject is still an open one.

A case of paralysis of the kidneys occurs in the third volume of the Journal. At the time this case was published only a few examples of this singular disease, described by Dr. John Mason Good, the celebrated author of the "Book of Nature," and of an erudite treatise on Medicine, under the name of *paruria inops*, had been recorded. The late Dr. George Hayward, of Boston, was the first to call attention to it in this country. An instance of it had previously been published by Sir Henry Halford, physician to George IV.

Another case of disease, deserving of brief mention, was one of polyp of the face, successfully treated by tartar emetic. The cure seems to have been perfect; for the woman, when last seen, three years afterwards, was entirely well. The tumor, apparently seated in the antrum, involved the upper jaw, and had assumed quite a threatening aspect when the patient was put under treatment, consisting of the internal use of a weak solution of tartrate of antimony and potassa, steadily persisted in for six months.

In 1824, Dr. Short had the misfortune to lose his venerated preceptor and early friend, Dr. Frederick Ridgely, of Lexington, Kentucky, and soon after this event he published a beautiful and well-merited eulogy upon his life and character. A native of Maryland, from which he had early emigrated to the West, Ridgely had been a surgeon in the Continental army, and for more than thirty years an eminent practitioner at Lexington. He was present at a number of the battles of the Revolution, possessed uncommon professional skill, had a well-cultivated mind and the most agreeable manners, and was especially noted for his charitableness to the needy and his unrequited services to the poor. Many of the most distinguished physicians of Kentucky, in his day, were his private pupils. Dr. Short was not only warmly attached to him, but loved him with filial affection.

In 1835, he published "A Brief Historical Sketch of the Origin and Progress of Cholera Asphyxia," based upon information mainly derived, as he himself states, from accounts of this disease in professed treatises and the reports of physicians and boards of health in various parts of the world. He traces the march of this frightful distemper from its first appearance in the Delta of the Ganges in 1817, to its irruption in June, 1833, at Lexington, whose population it completely decimated, carrying off more than six hundred persons in the space of a few weeks, in a city, which, up to that time, was regarded as so salubrious as to induce the belief in the minds of its most enlightened physicians that an outbreak of the epidemic would be a matter of impossibility.

Stated Meeting, December 1, 1865.

Present, fifteen members.

Prof. CRESSON, Vice-President, in the Chair.

A letter with photograph was received from Mr. R. W. Fox, near Falmouth, England, dated 7th month 11th, 1865.

A letter requesting the return of manuscripts was received from Mr. Julien, dated New York, Nov. 28th, 1865.

A letter concerning the Zeisberger manuscripts was received from Mr. D. W. Fiske, dated Syracuse, Nov. 13th, 1865. On motion, it was referred to the Library Committee.

A letter of envoi was received from Mr. I. A. Sheppard, dated Boston, Nov. 29th, 1865.

Donations for the Library were received from the London Meteorological Society, Boston N. H. S., Silliman's Journal, Mr. Sheppard, Dr. Hammond, Mr. Patterson, and the California N. H. Society.

The death of Dr. Wm. M. Euler, a member of the Society, at Philadelphia, on the 27th ult., aged 45, was announced by the Secretary.

An application for the Magellanic premium was read and referred to the Board of Officers.

Mr. Lesley communicated certain extracts from letters concerning the development of the East Kentucky oil region, with records of some of the recent borings.

1. A letter from Mr. Hamilton Lyon, dated Paintville, Ky., Oct. 30th, 1865, "Dear Sir: In accordance with my promise last spring inclosed you will please find the records of the boring of several wells in this vicinity, made up by the proprietors and superintendents with much care; and in the main, I think they are pretty reliable. Dixon's Oil turned out a mere seep, which a few hours' pumping exhausted. Of the 'Spradlin Well,' on 'Little Mud Lick,' the property of the 'Cliff Spring Co.,' which I am superintending, I am unable to give you anything like a definite record. The first 300 feet were bored before the war, and all records lost. I doubt very

much if one could have been got, from the fact that the gas has always carried the borings off. At 330, however, I am satisfied I struck the first Limestone; and at 341 a stratum of Shale, similar to that struck by Brown at 346. This was succeeded by Limestone, which has continued to where I am at present, 410. Brown's well and mine are on the same line of strike, one mile apart."

Low's Well, belonging to the Big Paint Creek Oil Co., and located in Preston's Flat, at the mouth of Paint Creek.

Conductor	69½ ft.	
White Sandrock	4	73
Black Slate	9	82
Dark Sandrock	8	90
White "	6	96
Dark Slate	59	155
Sandrock	9	164
Black Slate	56	220
Sandrock	180	400
Slate	6	406
Sandrock	84	490
Black Sandrock	20	510
Black Slate	10	520
Limestone, Dark Sandrock, Limestone xi	20 / 25 / 47	540 / 565 / 612
Salt Water, at from	375 to 400	

Steven's Well, on Wallace Ruel's Place, on Paint Creek, one mile from Paintville.

Conductor	40 ft.	
Slate and Soapstone	9	49
Coal	2	51
Gray Sandrock	380	431
Blue "	2	433
Dark "	22	455
Soapstone	14	469
Limestone or fine sand	7	476
Light-colored Slate	3	479
Dark Sand	14	493
Limestone xi	115	608
Olive Shale	57	665
Light-colored Slate	15	680

Madison Petroleum Co.'s Well, opposite Stafford's Mill, four miles from Paintville and on the same side of the Creek. Brown, Supt.

Conductor	49 ft.	
Gray Sandrock	10	59
White " (hard)	1	60
Soapstone and Clay	1	61
Gray Sandrock	281	342
Black Calcareous Sand	4	346
" Slate	8	354
" Calcareous Sand	16	370
Limestone (hard) xi	77	447
Olive Shale	94	541
Slate	85	626
Strong Salt Water at	290 ft.	

Dixon's Well on Paint Creek, and three hundred yards from Old Hinkley Well, nine miles above Paintville.

Conglomerate Sandrock	15 ft.	
White "	19	34
Laminated "	*17	51
Gray "	36	87
Soapstone	67	154
Hard White Sandrock	36	190
Blue "	5	195
Soapstone	18	213
Slate	6	219
Coarse White Sandrock	31	250
Flinty Rock	7	257
" Sandrock	15	272
Brown " and Chalk	8	280
White Sandrock	*42	322

* All Conglomerate

** Limestone

Struck vein of oil at 298 ft.

2. A letter from Mr. U. C. Burnap, Brooklyn, Nov. 27th, 1865: "About a dozen wells are in progress on Paint Creek, some of them down 900 feet; but as yet no oil has been struck, except small veins near the surface. Operations are still going on, and at least two of the wells will be put down to 1500 feet. New wells are being commenced near the Oil Springs, though the opinion seems to be gaining ground that the deposits of oil are *above* the water-level and that no oil will be found except the heavy oil which leaks through the XII series. All the Sandy Valley has been very thoroughly prospected from a point seven miles below Louisa to Paintville. Not less than 30 wells are now going down, many of which are below 600 feet.

It is said that the operations in Cumberland County have been successful, and that several large wells have been struck; but the stories are rather apocryphal.

My last trip extended up 130 miles above Paintville to the Tennessee line. All through the Valley the same exhibitions of surface oil are found, but no wells are going down above the mouth of Paint.

Every well down 500 feet is producing salt water in abundance."

Mr. Lesley remarked upon the contents of these letters that they went to confirm his published views of the source of the surface oil deposits of the Valleys of the Sandy in Eastern Kentucky. There is an actual horizon of oil at the base of the coal measures. The plants of the great conglomerate (XII) have been converted into thick oil, and reach the surface by a horizontal drainage above water-level, over the water-bearing shales of the False or Lower Coal Measures. The next horizon of oil is undoubtedly far down in the Devonian, near or even below the base of the Knobstone Formation of Kentucky.

Dr. Newberry read a paper at the meeting of the National Academy, held in August last at Northampton, Mass., in which he asserted that the great flows of oil which took place, years ago, in Southern Middle Kentucky, came from the *Lower* Silurian Limestones. The same horizon has yielded oil in limited quantities back of Chicago in Illinois. Mr. Lesley learned, during a recent visit to Montreal, that the Canadian Geological Survey had found the Lower Silurian Limestones of the Manatoulin Islands in Lake Huron, oil bearing. Mr. Lesley lately saw, himself, small quantities of petroleum trickling from Upper Silurian Limestones at Cape Gaspé, the easternmost point of Canada East, the surfaces of the limestone bed being almost covered with the vestiges of cocktail fucoids, coralloids, bivalves, and trilobites.

Stress has been laid by some geologists of note upon a supposed genetic connection between the accumulation of Petroleum and anticlinal axes. But there are no anticlinal axes in the Pennsylvania oil region of the French and Oil Creek wells, nor in the Pennsylvania and Ohio Oil region of the Beaver River, nor in the E. Kentucky oil region of the Sandy and Licking waters. The only well-defined anticlinal among oil wells is a mere upsqueeze crossing the Ohio River near Marietta, bringing the oil rocks near enough the surface to be tapped, and thus only effecting the finding of oil. There is no apparent connection between the petroleum of the Alleghany River salt wells above Pittsburg, and any of the anticlinals which separate the great coal area into basins, to the east of them. The asserted east and west anticlinals of the Enniskillen oil region in Canada West, are very problematical, their places being covered by a peculiar mud drift of local character; and their existence has been rendered still more doubtful by the recent discovery by Prof. James Hall, of *Genesee Slates* on Lake Huron, and at points between it and Lake Erie. This goes to show a north and south synclinal just across the supposed lines of east and west anticlinal. The true relationship of petroleum with surface springs seems to be one of simple hydrostatics. Every natural oil-spring is an artesian spring, without regard to the existence of anticlinals or profound earth-crust faults.

Dr. Wirtz has recently published a remarkable and important report upon the West Virginia petroleum vein, and its mineral matter, which, he says, is not *Albertite*, but a new compound, which he calls *Grahamite*. He has admirably well discussed the selvage structure of the vein. But the geological evidences of the generation of this mineral from the petroleum, which is obtained by the borings of that region, must outweigh any mere chemical reasoning on the composition of the mineral itself; especially when we recollect how infinitely varied are the characters of the products of different oil wells. Dr. Wirtz is wrong in ascribing to Mr. Lesley any idea of connecting the asphaltum of this vein with the Marietta anticlinal or any other. The vein crosses the Marietta upthrust (it is no anticlinal in the ordinary sense) nearly at right angles.

The following is a record of about 950 feet of the Babcock and Adams well, now going down, on the property of the Clarion Coal & Oil Co., three or four miles north of Buena Vista, in McKean County, Pa., given by Mr. O. N. Adams, of Chicago.

Judge Wilcox's old mansion, about 425 feet above the Valley.
Lowest coal-bed, about 300 feet above the Well in the Valley.

				ft.
Mouth of well.				
Pipe conductor				41
Slate rock				30
Red rocks	137			
Sandstone	8	—		
Slate	26	—	These red rocks represent the red shale formation. No. XI, under the conglomerate; the red sand formation No. IX; and the "red band" in No. VIII.	344
Red rocks	64			
Blue sand rock	21	—		
Sand rock	5	—		
Red rocks	31			
Slate rock	13	—		
Sand rock	8	—		
Red rocks	31			
First sand rock made up of quartz crystals				14
Slate rocks and thin sands	85			
Sand rocks and some slates	47		Chemung?	209
Slate rocks and thin sands	77			
Second sand rock made up of quartz crystals				20
Slate rocks, &c.	43			
Sand rocks, &c.	48			
"Soapstone" (compact clays)	65		Portage?	256
Dark sandy rocks, about	40			
"Soapstone" (clay beds) about	60			
Total, present sinking, Dec. 1, 1865,				914
Or, below the coal, about				1200

Mr. Chase referred to the lately published hydrogen sulphur tests of Mr. Barrett in England, and thought they afford a plausible explanation of the production of the peculiar odor so often noticed in connection with the striking of objects by lightning.

Mr. Marsh described his observations on the nights of the 12th and 13th of November from his window in Germantown, looking towards the radiant point in the northeast. Even under these unfavorable circumstances he was able to observe 66 meteors in 96 minutes. The hourly average has therefore been steadily on the increase for the last four years, giving a good reason for expecting the grand maximum next year.

Dr. Wilcox described the phenomenon as he saw it in the country from 11 P. M. to 5½ A. M. About midnight two meteors rose from the horizon and vanished upwards; many

others skirting the horizon. The radiant point was well defined and fixed.

The Treasurer presented his annual report, which was referred in due course to the Finance Committee.

The Publication Committee presented its annual report.

Pending nominations 540–544, and new nomination 545 was read.

On motion of the Librarian, the Montreal Natural History Society was ordered to be placed on the list of Corresponding Societies to receive both Proceedings and Transactions.

And the Society was adjourned.

Stated Meeting, December 15, 1865.

Present, thirteen members.

Dr. Wood, President, in the Chair.

Letters, acknowledging the receipt of Transactions and Proceedings, were received from the following corresponding societies:

New York Historical Society, May 31, 1865, Nos. 12, 13, 14, XIII, i.
Rheinland Nat. Hist. Union, March 3, 1865, " 67, 69.
German Geological Society, Nov. 6, 1864, " 69, 70.
Royal Academy, Lisbon, March 22, 1865, " 69, 70.
Imp. Soc. Naturalists, Moscow, Feb. 26, 1865, " 69, 70.
American Oriental Society, May 26, 1865, " 70, 71.
Lists XIII, i.

Royal Bot. Gardens, London, Aug. 15, 1865, Nos. 71, 72. Lists and XIII, i.

Society of Antiquaries, London, Nov. 17, '65, " 71, 72. Lists and XIII, i.

Smithsonian Institution, March 20, 1865, No. 72. Catalogue and Lists.

New Hamp. Hist. Society, Aug. 11, 1865, No. 73.

Northern Academy Arts and Sciences, Aug. 10, 1865, No. 73.

Essex Institute, Salem, Aug. 12, 1865, No. 73.

Massachusetts Histor. Society, Nov. 1, 1865, No. 73, and XIII, i.

Boston Athenæum, Aug. 19, 1865, No. 73.

Albany Institute, Aug. 28, 1865, No. 73.

New York Lyceum N. H., Sept. 11, 1865, No. 73.

New York Hist. Society, Sept. 1, 1865, No. 73.

Buffalo Soc. Nat. Sciences, Sept. 24, 1865, No. 73.

U. S. Coast Survey Off., Aug. 8, 1865, No. 73, and XIII, i.

St. Louis Academy Sciences, Aug. 11, 1865, No. 73.

Harvard College, Cambridge, June 1, 1865, XIII, i.

New Jersey Hist. Society, June 20, 1865, XIII, i.

Nat. Hist. Soc. Northumberland, &c., Aug. 9, XIII, Catalogue.

Letters, respecting the Zeisberger Onondaga MSS. in the Library of the Society, were read from the Rev. Dr. E. A. Dalrymple, of the Maryland University, 32 Mulberry Street, Baltimore, December 7; and from Mr. H. A. Brickenstein, Secretary of the Society of the United Brethren, &c., Bethlehem, December 13, 1865.

Donations for the Library were received from the United States Mint, and Prof. Winehell, of Michigan.

Copies of the second part of Vol. XIII of the Transactions, just published and ready for distribution, were laid upon the table.

The report of the Finance Committee was read, and the following appropriations for the expenses of the Society for

the ensuing year, recommended by the Committee, were, on motion of Mr. Fraley, made:

Salary of Librarian, ...	$700 00
Salary of Assistant to Librarian, . .	360 00
Petty expenses of Librarian, . .	50 00
Salary of Janitor, ...	100 00
Binding, ...	150 00
Journals, ...	50 00
Hall account, ...	200 00
Insurance, ...	200 00
Publications, in addition to the interest of the publication fund, . . .	1,500 00
General expenses, of all kinds other than the above, and including the commissions of the Treasurer, . . .	590 00
	$3,900 00

Pending nominations 540 to 545, and new nomination 546, were read.

The recommendation of the Library Committee respecting the Zeisberger MSS. being read, on motion of Mr. Fraley the question was referred to the secretaries to report.

On motion, Society adjourned.